

CLAIMS

1. A method of generating kinetic power for propulsive force in a resilient lower extremity prosthesis including a foot, an ankle and an elongated, upstanding shank above the ankle, the method comprising:
 - expanding at least one sagittal plane concavity of the resilient prosthesis during force loading of the prosthesis in the active propulsion phase of a person's gait to store energy in the prosthesis;
 - releasing said stored energy in the later stages of stance-phase of gait to add to the propulsion of the trailing limb and person's body;
 - wherein during said force loading of the prosthesis in the active propulsion phase of gait storing additional energy in an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis and in said later stages of stance-phase in gait, releasing said additional energy to further add to the propulsion of the person's trailing limb and body.
2. The method according to claim 1, wherein said expanding includes expanding a concavity formed by an upwardly arched midfoot of said foot.
3. The method according to claim 1, wherein said expanding includes expanding a posterior facing concavity of said shank.
4. The method according to claim 1, wherein a monolithically formed resilient member of said prosthesis forms said ankle and said shank, and wherein said expanding includes expanding a concavity formed by an anterior facing convexly curved portion of said resilient member.
5. The method according to claim 1, wherein said storing additional energy in an artificial muscle includes tensioning a viscoelastic material provided on at least one of the foot, ankle and shank of the prosthesis.

6. The method according to claim 1, including adjusting the energy storage capacity of the prosthesis by preloading the artificial muscle in tension prior to use of the prosthesis.
7. The method according to claim 6, wherein said preloading includes using at least one of a cam, a pad and a bladder containing pressurized fluid to tension the artificial muscle.
8. The method according to claim 1, including providing an artificial muscle on the foot of the prosthesis.
9. The method according to claim 8, wherein said foot includes a foot keel, said artificial muscle connecting plantar posterior and anterior portions of the foot keel.
10. The method according to claim 8, wherein said foot includes a foot shell over the lower extremity of the prosthesis, said artificial muscle connecting plantar posterior and anterior portions of the foot shell.
11. The method according to claim 1, including connecting said prosthesis to a socket on a leg stump of a person's body, and wherein said artificial muscle provided on the prosthesis extends from said prosthesis to said socket.
12. The method according to claim 1, wherein a monolithically formed resilient member of the prosthesis forms the ankle and the shank, the resilient member at least in the area of the ankle being anterior facing convexly curved, and wherein an artificial muscle is provided on said resilient member.
13. The method according to claim 12, further comprising providing an artificial muscle on said foot of the prosthesis.

14. The method according to claim 1, including forming said artificial muscle using a viscoelastic material selected from the group consisting of rubber and polymer.
15. The method according to claim 1, further comprising during said force loading of the prosthesis detecting a force exerted by the prosthesis and adjusting the energy storage capacity of said artificial muscle during said force loading as a function of the detected force.
16. The method according to claim 1, including preloading the artificial muscle in tension prior to said force loading in gait to increase the potential energy of the prosthesis.
17. A resilient lower extremity prosthesis comprising:
 - a foot;
 - an ankle;
 - an elongated, upstanding shank above the ankle;
 - an artificial muscle provided on at least one of the foot, ankle and shank of the prosthesis for storing energy during force loading of the prosthesis in the active propulsion phase of a person's gait and in the later stages of stance-phase of gait releasing said energy to aid propulsion of the person's trailing limb and body.
18. The prosthesis according to claim 17, wherein said artificial muscle is preloaded in tension to increase the potential energy of the prosthesis.
19. The prosthesis according to claim 17, further comprising means for adjusting the energy storage capacity of the prosthesis by adjustably preloading the artificial muscle in tension.
20. The prosthesis according to claim 19, wherein said means for adjusting is selected from the group consisting of a cam, a pad and a bladder containing pressurized fluid.

21. The prosthesis according to claim 17, including an artificial muscle on the foot of the prosthesis.
22. The prosthesis according to claim 21, wherein the foot includes a foot keel and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot keel.
23. The prosthesis according to claim 21, wherein the foot includes a foot shell over the lower extremity of the prosthesis and said artificial muscle on the foot connects plantar posterior and anterior portions of the foot shell.
24. The prosthesis according to claim 17, wherein said artificial muscle extends between and connects the prosthesis and a socket on a leg stump of a person's body when the prosthesis is in use.
25. The prosthesis according to claim 17, wherein a monolithically formed resilient member of the prosthesis forms the ankle and the shank, the resilient member at least in the area of the ankle being anterior facing convexly curved.
26. The prosthesis according to claim 25, wherein said artificial muscle is provided on said resilient member.
27. The prosthesis according to claim 26, wherein an artificial muscle is also provided on said foot.
28. The prosthesis according to claim 17, wherein said artificial muscle is formed at least in part of a viscoelastic material selected from the group consisting of rubber and polymer.
29. The prosthesis according to claim 17, further comprising a detector for detecting a force exerted by the prosthesis during said force loading of the

prosthesis, and means responsive to the detected force for adjusting the energy storage capacity of the artificial muscle during said force loading as a function of the detected force.

30. The prosthesis according to claim 17, wherein said artificial muscle has a wider cross sectional area at an intermediate portion along the length of the muscle.